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AN AEROBIC DIGESTION TOILET

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FIELD OF THE INVENTION

This invention relates to a toilet which provides aerobic digestion of primary sewage and evaporation of the liquid waste.

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BACKGROUND TO THE INVENTION

Toilets which provide aerobic digestion of primary sewage are known. One type makes use of a toilet bowl above a chamber having means for inducing convection flow through the chamber and an outlet vent by heating through exposure to sunlight. This is the kind of toilet described in the specification of European Patent No. EP 0879576.

Whilst effective, such toilets do suffer the disadvantage that they are fairly bulky and generally do not provide for the separation of fluids from solids prior to treatment. Some do endeavour to obtain separation within the toilet bowl but this is also only partially successful.

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OBJECT OF THE INVENTION

It is an object of this invention to provide an aerobic digestion toilet which can be of smaller construction than such existing toilets and which provides better digestion through separation of liquids from solids.

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SUMMARY OF THE INVENTION

In accordance with this invention there is provided an aerobic digestion toilet including a chamber, a toilet bowl above the chamber having an outlet vent and
5 means for generating convection flow through the chamber from adjacent the floor thereof through the outlet vent from the chamber, characterised in that a conveyor is located below the toilet bowl and configured to receive material falling from the toilet bowl and move it upwardly at an incline to discharge onto a downwardly inclined tray.

10 Further features of the invention provide for the tray to be inclined at different angles along its length; for the tray to be inclined at a steeper angle adjacent the conveyor than the remainder of the tray remote from the conveyor, for the tray to provide feed into a solids receptacle; and for the solids receptacle to be
15 removably located in the chamber.

The angle of inclination of the conveyor can be in the range of 3° to 10° to the horizontal and the inclination of the tray to be between 20° and 45° at the conveyor end and 10° to 30° at the end remote therefrom.

20 Yet further features of the invention provide for the conveyor to be a belt conveyor, preferably a sprocket-engaging belt, and for the lower end of the conveyor to feed into a fluids receptacle. The belt may be outwardly lipped along its edges and provided along the sides and lower end with guide plates.

25 Still further features of the invention provide for the conveyor to be movable in a stepwise fashion; for the conveyor to be manually movable; and for a closure plate for the outlet from the toilet bowl which member is tiltable from adjacent the toilet bowl to open the outlet from the toilet bowl.

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The conveyor will be provided with a stepwise mechanical drive which may be a lever-operated ratchet driving a sprocket engaging the conveyor belt and with a linkage extending to a tiltable toilet bowl cover.

- 5 The invention also provides for the closure member to be a screen to operate by a person using the toilet.

The tiltable cover may also be connected to the closure plate for the toilet bowl outlet and be biased in use to a closed position.

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A still further feature of this invention provides a kit for retro-fitting for existing aerobic toilets comprising a conveyor and drive assembly and discharge tray and a supporting frame.

15 **BRIEF DESCRIPTION OF THE DRAWINGS**

A preferred embodiment of the invention will be described, by way of example only, with reference to the diagrammatic drawings in which:

- 20 Figure 1 is a sectional side elevation of an aerobic digestion toilet;
Figure 2 is a sectional end elevation of the aerobic digestion toilet in Figure 1; and
Figure 3 illustrates a retro fit kit for existing aerobic toilets.

25 **DETAILED DESCRIPTION OF THE DRAWINGS**

An aerobic digestion toilet (1) is shown in Figure 1 and Figure 2 and has a chamber (2) the lower part of which is sunk below ground level. A toilet bowl (3) is provided above the chamber (2).

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An outlet vent (4) in the form of a round cross-sectioned black plastics material pipe (5) has a wind turbine (6) at its upper end. This pipe (5), when exposed to sunlight, generates radiant heat within the vent (4) resulting in convection flow of gas from the chamber (2) to the atmosphere. It has been found that an adequate
5 airflow can be obtained through the toilet bowl (3) assembly into the chamber (2).

The chamber (2) has a manhole and manhole cover (8) to allow access into the chamber (2). The manhole cover (8) is secured by a hinge (9) to the chamber (2) and is made as a panel of heat absorbent material to increase the radiant heat
10 generated in the chamber (2) which facilitates convection flow therethrough.

The chamber (2) can be a built-in structure of bricks or blocks but in this embodiment is moulded in suitable plastics material. The chamber (2) is moulded in two parts with the base (11) sunken below ground level and the upper
15 enclosure (12) extending above ground level.

The vent (4) and manhole cover (8) form means for generating convection flow through the chamber (2). It will be appreciated that any part of the upper enclosure can also be made of heat absorbent material to serve as means for
20 generating such convection flow.

The enclosure (12) of the chamber (2) may have a transverse trough (13) provided to accommodate the foundation for a wall (indicated in dotted lines in Fig 1). This is useful where it is desired to install the toilet (1) prior to building a
25 house or other structure.

The two parts (11) and (12) of the chamber (2) are joined along the flange line indicated at (14) with the bottom edge of the enclosure (12) nesting along the top edge of the base (11). Any suitable chamber construction can be used.

A pivoted closure plate (15) is mounted to keep the outlet from the bottom of toilet bowl (3) normally closed and to avoid any waste on a conveyor (16) being visible to the user.

- 5 The conveyor (16) includes a non-porous belt (17) running on a pair of spaced apart sprocket rollers (18), is mounted within the chamber (2) at an incline of approximately 4°. The belt (17) may have lips (not shown) extending along its edges and guide plates (16A) along its sides and lower end. These plates (16A) can be seen in Figure 3 and prevent solid material from falling from the sides and
10 lower end of the belt (17). The lowermost part (19) of the conveyor (16) is situated below the outlet to the toilet bowl (3). The uppermost part (20) of the conveyor (16) feeds onto a downwardly inclined tray (21).

- The operation of the conveyor (16) is effected through a suitable linkage between
15 a handle (30) connected to a drive mechanism for the conveyor (16). As shown the linkage includes a rod (23) pivotally secured to a lever (24) which operates a ratchet mechanism (25) to drive the uppermost roller (18). The rod (23) controls the operation of the conveyor (16). The rod (23) is activated with the handle (30) being depressed by a person using the toilet (1).

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- The closure plate (15) is connected to the underside of the toilet seat (22) by a cranked rod (22A) which is pivoted thereto. This forms part of a spring mounted linkage mechanism (32) which will pull the plate (15) to the open position when the toilet seat (22) is depressed. When the weight is removed from the seat (22),
25 the closure plate (15) reverts to the normal closed position.

Any suitable mechanism can be used to ensure a stepwise operation of the conveyor (16) and the closure plate (15). This movement of the seat (22) could also be used to move the conveyor (16).

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The tray (21) is initially inclined at about 45° adjacent the conveyor (16) and for the remainder of its length at about 30°. The tray (21) feeds into a solids receptacle (26) which has a carrying handle (27) to allow for easy removal thereof through the manhole. A spare receptacle (28) is provided in the chamber
5 (2) and located on a shelf (29) near the top of the chamber (2).

The lowermost part (19) of the conveyor (16) extends over a fluid receptacle (31) formed by a depression in the bottom of the chamber (2).

- 10 In use, raw sewage is deposited through the toilet bowl (3) onto conveyor belt (17) as the closure plate (15) will automatically open when a user is seated. The stepwise upward movement of the belt (17) can be effected both before and after the toilet (1) is used.
- 15 Fluid, such as urine, deposited onto the belt (17) will flow downwardly off the conveyor (16) and thence into the fluids receptacle (31). This separates liquids from solids on entry into chamber (2). The fluids receptacle (31) is formed by the total space below the tray (21). From there any excess fluid which is not evaporated will flow either through drain outlets (33) into a transpiration bed
20 outside the unit or into an evaporation tank (not shown) also outside the unit. Solid waste remains on the conveyor (16) and is moved slowly upwardly each time the lever (24) is operated. During the time that the solids spend on the conveyor (16) this solid waste has time to dry. By the time that the solid waste reaches the end of the conveyor (16) and falls onto the tray (21) it is partly
25 digested. Complete digestion takes places on the tray (21) during downward movement of the material to the solids receptacle (26). Once sufficient material has collected in the solids receptacle (26) it can be removed through the manhole and the material either used or otherwise disposed of.

Alternatively the material can be dealt with in a two-stage process being retained on the shelf (29) in a receptacle (26) while the next receptacle (28) load is collected. This will subject the material to an even longer period of aeration.

- 5 It is a feature of this invention that it provides a kit including the conveyor (16) and drive assembly which includes a ratchet mechanism (25) and discharge tray (21) together with a mounting frame (34) for the conveyor (16) and a support frame (35) for the discharge tray (21) as shown in Fig 3 which can be used for retro fitting previously installed toilets of the kind referred to.

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The toilet can be made smaller than similar prior units or other units of conventional construction through use of the conveyor for moving material in the chamber. This feature permits the toilet to be more compact especially in terms of its height and hence requires less excavation during installation of the unit.

- 15 Also the early separation of liquids from solids facilitates the aerobic digestion of the raw sewage deposited in the chamber.

It will be appreciated, however, that many other embodiments of an aerobic digestion toilet exist which fall within the scope of the invention especially as regards the construction and configuration thereof. For example, any suitable conveyor and drive means can be used. Also, additional means can be included in the chamber to facilitate the evaporation or other dispersion of urine deposited in the toilet.

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